The Biology of Vascular Access

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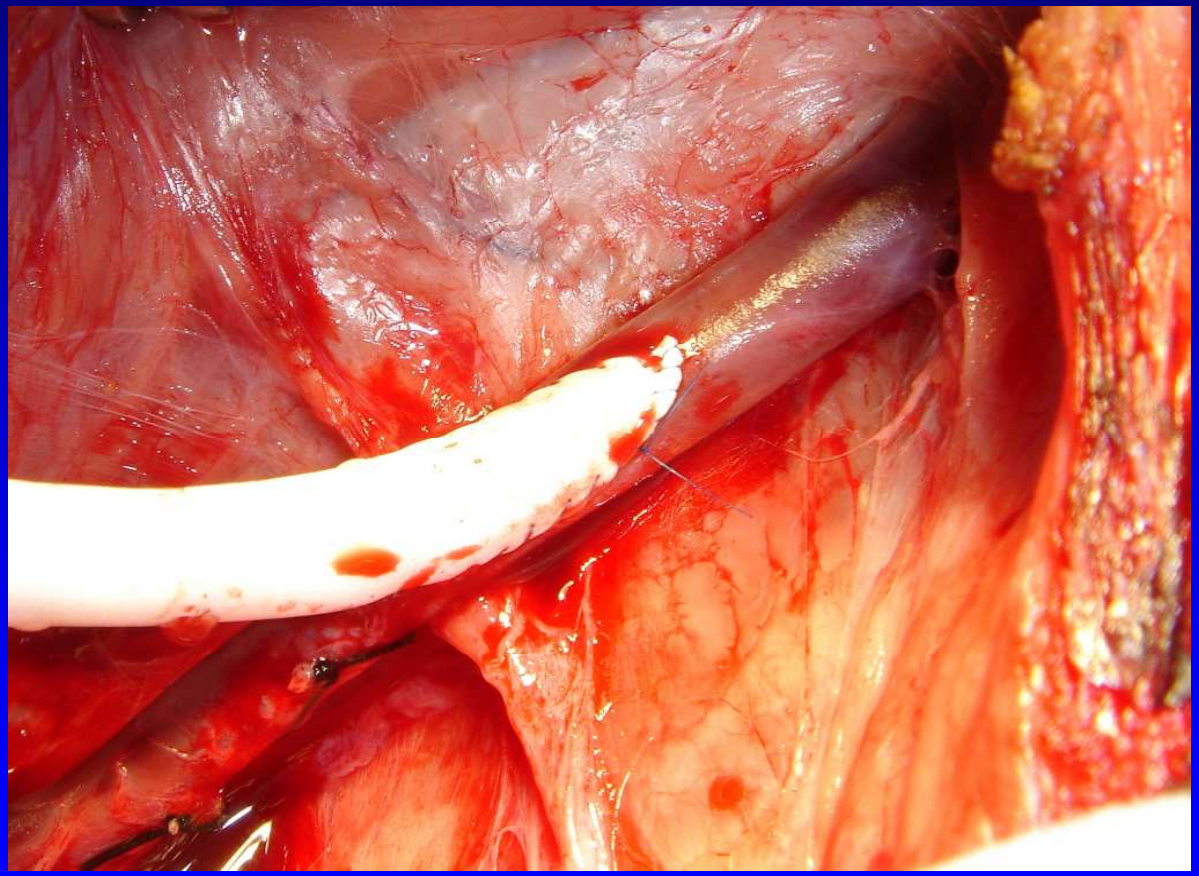
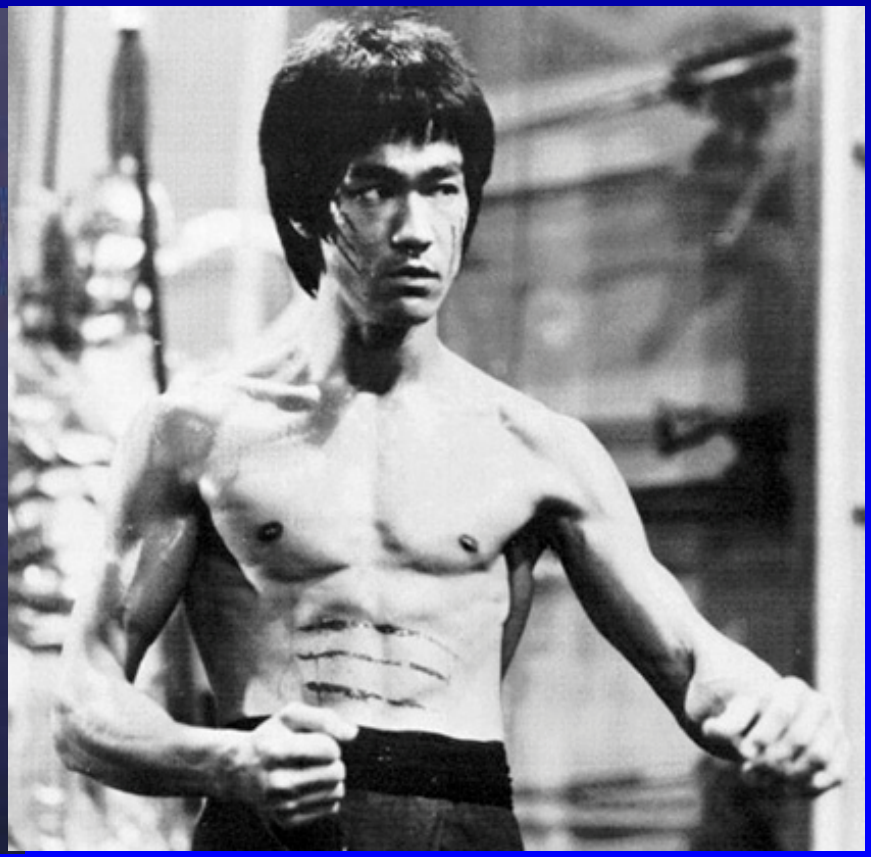
So What is Important About the Biology of Access?

- Anatomy
- Biology
- Artery
- Vein
- Conduit
- Patient



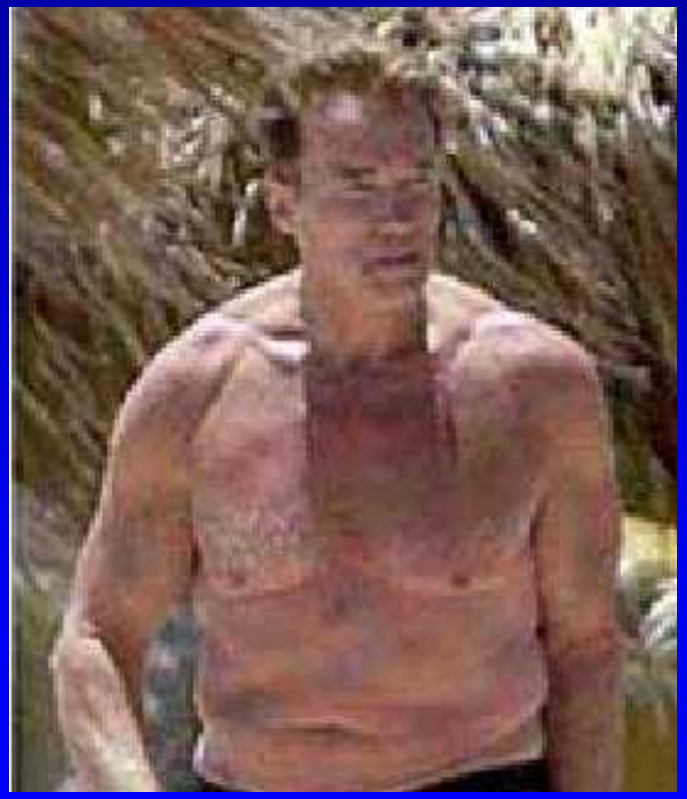
Anatomy

- Fat vs. Thin
- Where is the artery and outflow vein?



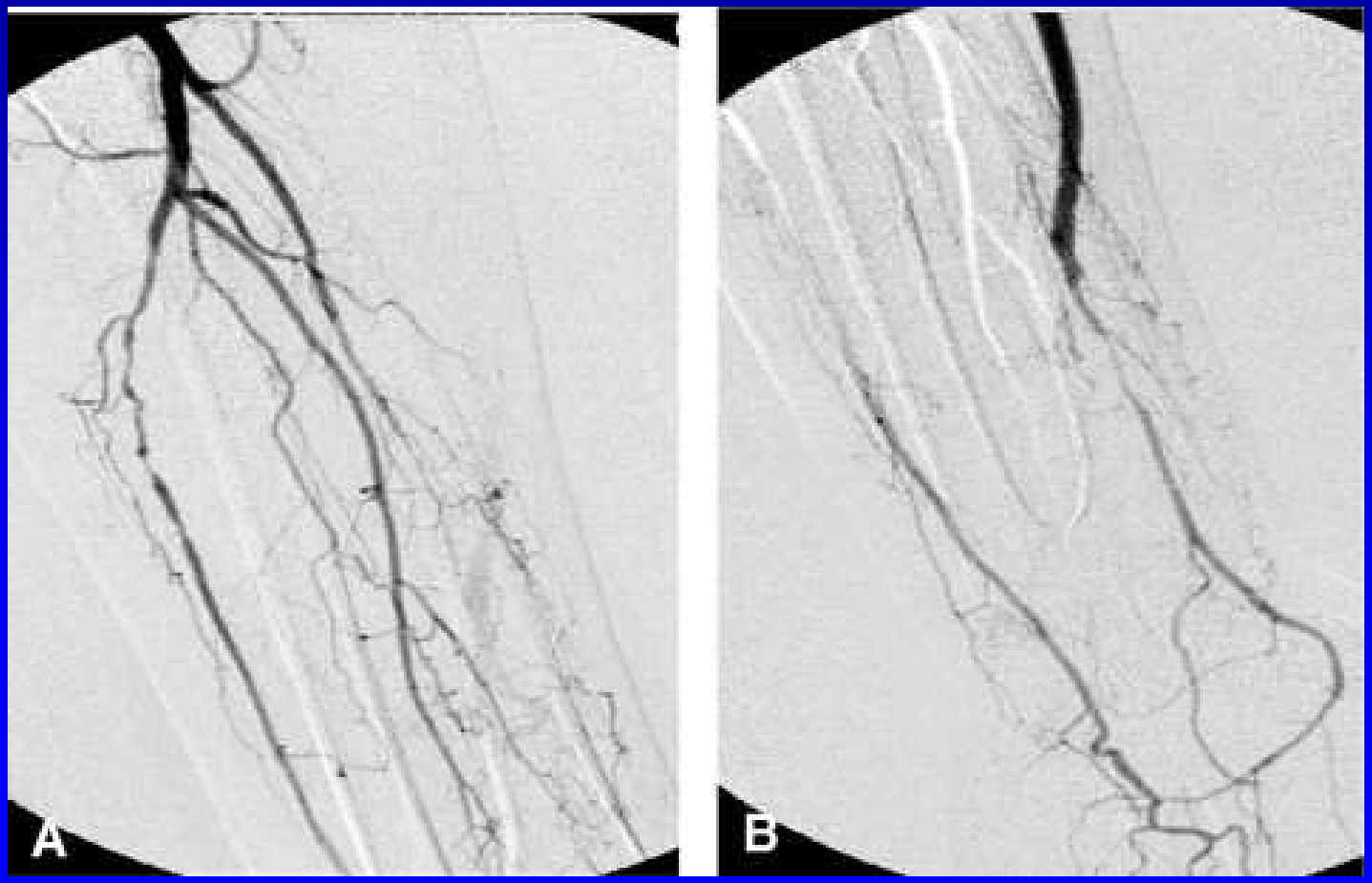
Age and Physiology

- Young vs. Old
- How “good” is the artery and outflow vein?



Arterial Inflow

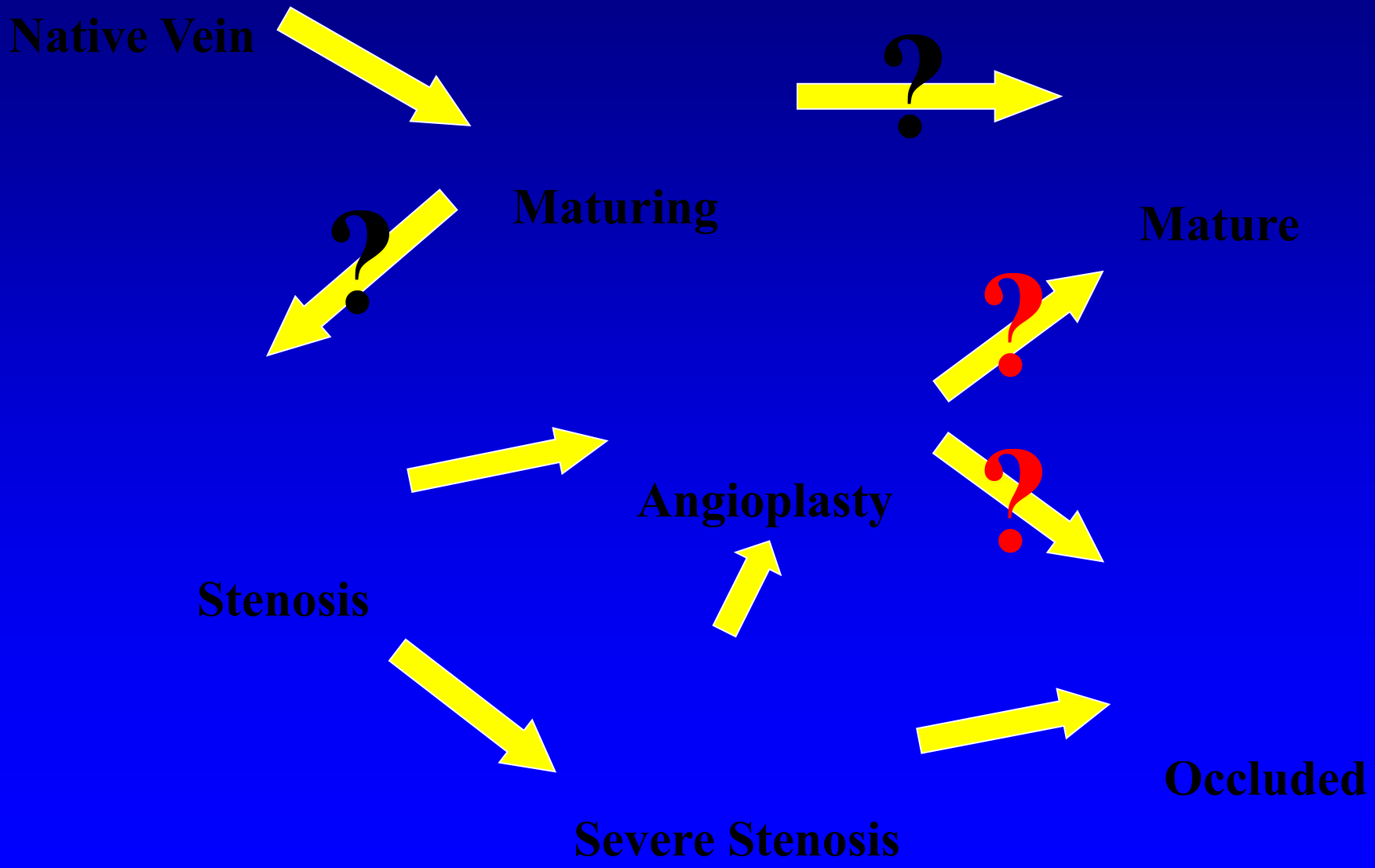
- Normal radial artery = 60 ml/min
- Radiocephalic fistula = 500 ml/min
- Bad artery = no access



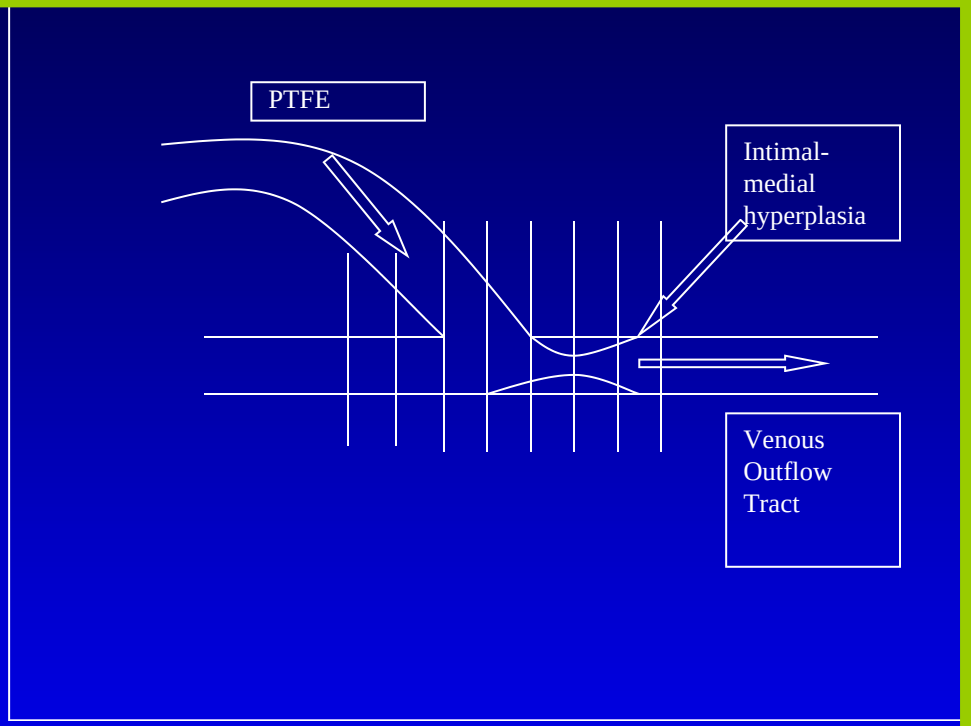
Veins

- Where is the vein?
- Has it been stuck?
- Ultrasound and veinogram?

Fistula Bio/Pathology



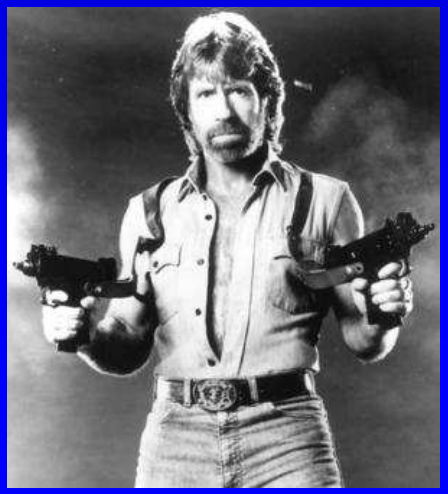
AV Graft Pathology



Blood and Biochemistry

- Sticky blood?
- Veins grow closed?
- No way to know…

Genetics



In access….

There are many more questions than answers

Blood likes to move through tubes lined by cells

Blood likes to move through tubes that wiggle

Even the best veins don’t like being arteries

So…Where are we headed?

If We Knew What Caused Proliferation and Thrombosis…. What Type of Biologic Therapies Would you use?

- Anticoagulants and Anti-inflammatories
- Protein or Anti-proliferative therapeutics
- Gene Regulation and Cell Therapies
- Tissue Engineering and 3-D Printing

..and if you knew what to use, how would you get “durable” therapy to the target anatomy?

- Time release therapy
- Drug eluting stents
- Drug eluting grafts
- Gene therapy
- Cell therapy
- Vessel therapy

Anticoagulants

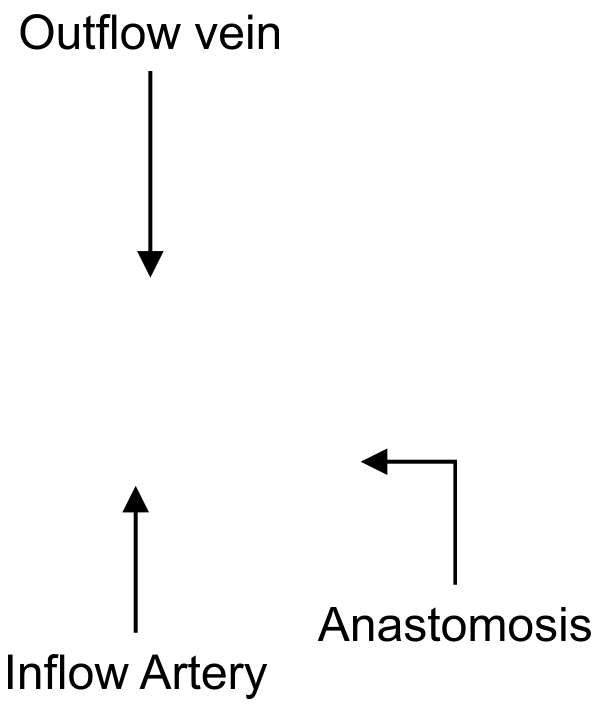
To date there are no pivotal randomized clinical trials with formal anticoagulation … and/or new drugs that are not warfarin

DAC – Largest NIH Trial

Fistulas – Plavix

Grafts – Diprimidol and Aspirin

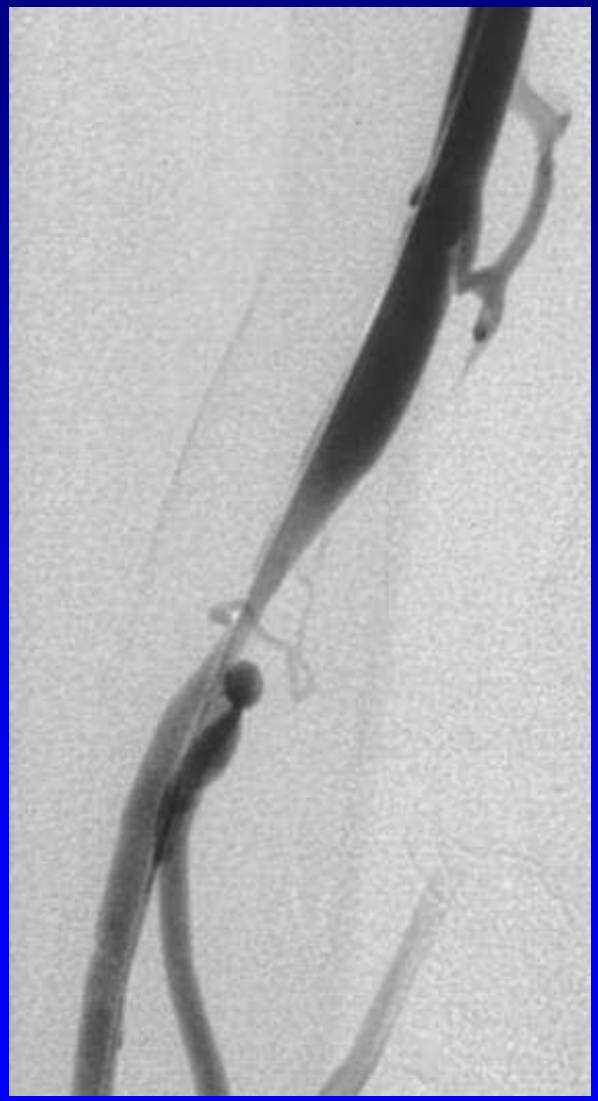
Protein Therapeutics:
Recombinant Human Pancreatic Elastase



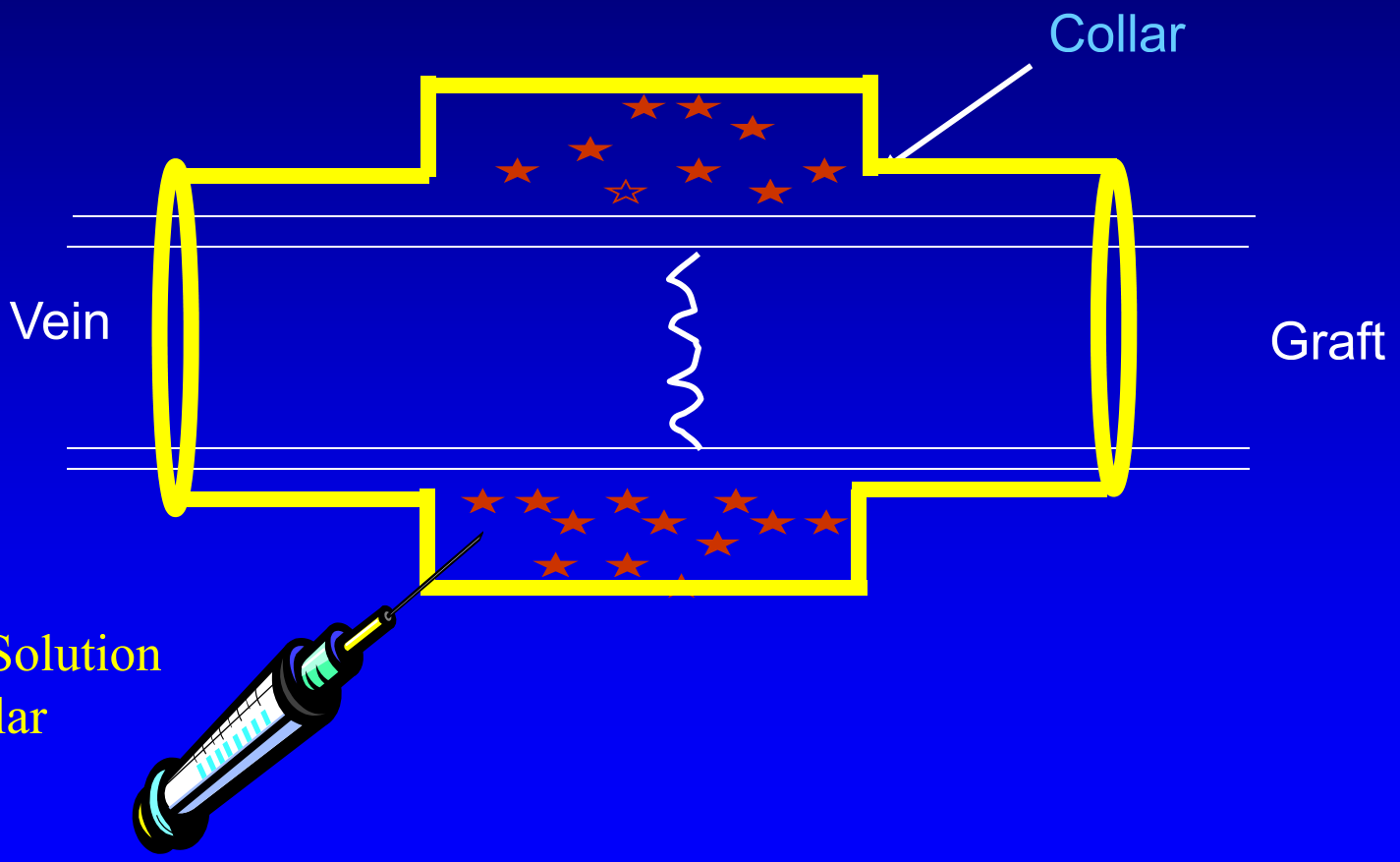
- Topically applied to adventitial surface
- 2.5 mL delivered over 10 minutes
  - Series of drops delivered every 20 seconds
- Irrigation of surgical site with saline lavage for 1 minute after treatment

Anti-Proliferative Agents…

Drug Eluting Balloons

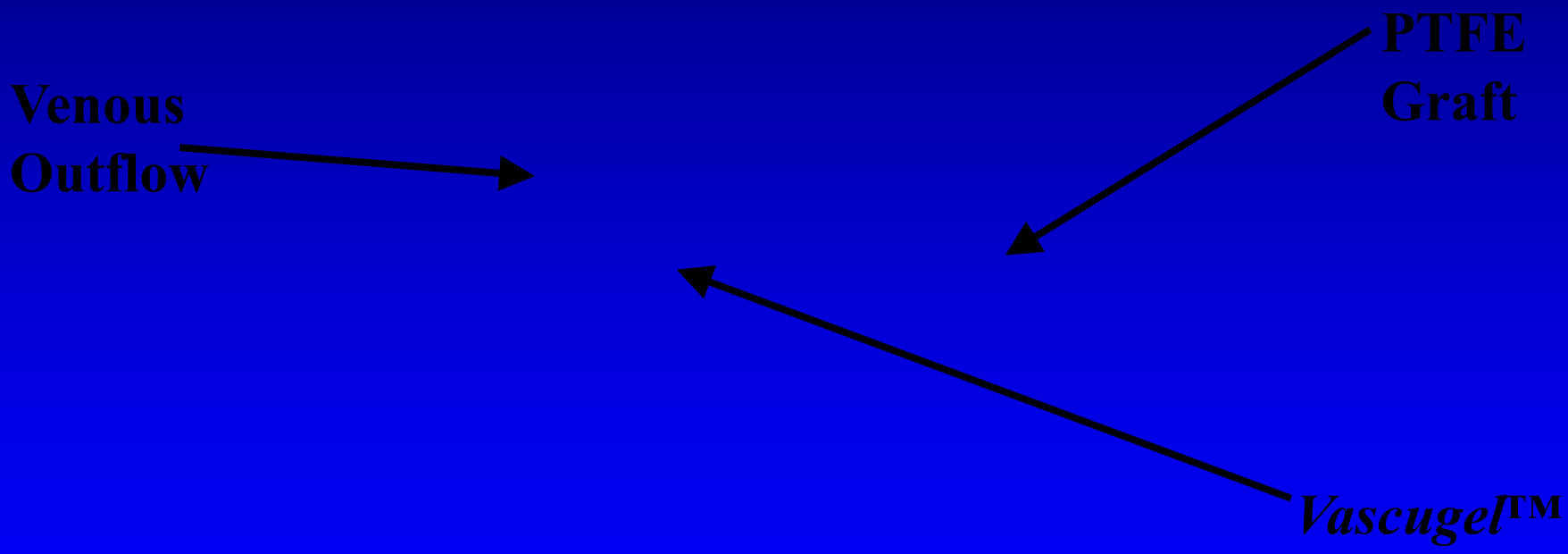


Gene Therapy…….

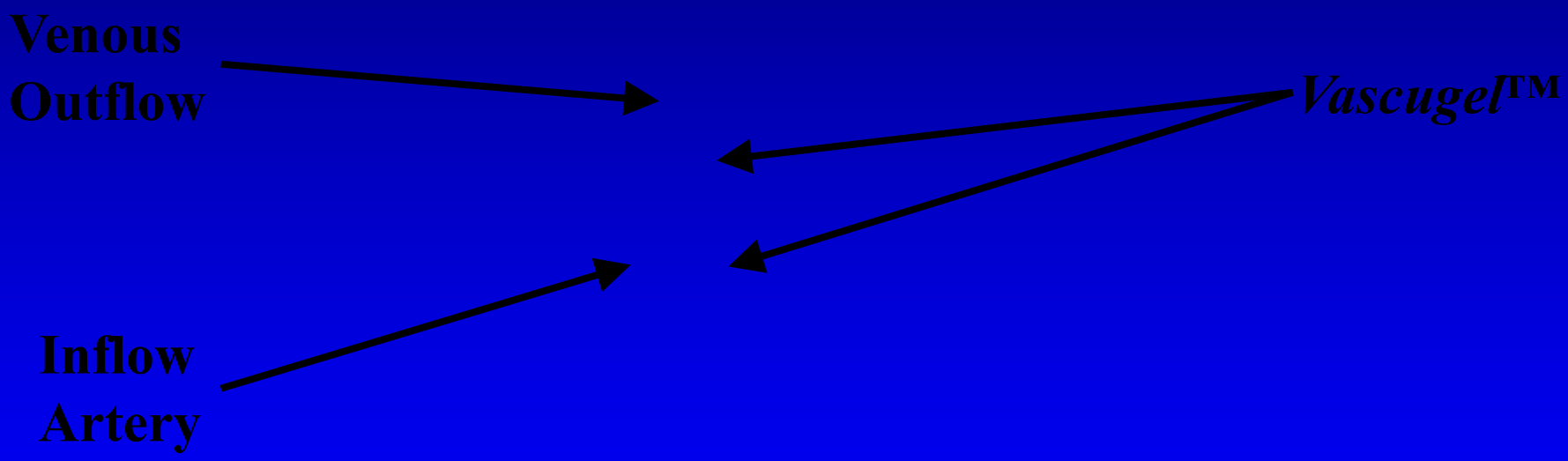


Cellular Therapies

Vascugel® Used for Arteriovenous Graft



Vascugel® Used for Arteriovenous Fistula



Graft Therapy

Image Courtesy of Duke University

For Biologic Therapies the Real Questions Remain…..

- Will these therapies work in randomized, real world, clinical trials?
- Who will pay for these "biologic advances" in vascular access treatment?
- Will the "improved" patency justify the "cost" of the treatment?

Thank You